

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2012 question paper  
for the guidance of teachers**

**0654 CO-ORDINATED SCIENCES**

**0654/22**

Paper 2 (Core Theory), maximum raw mark 120

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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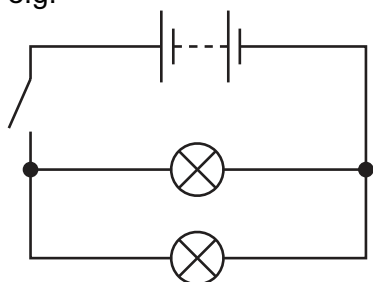
- 1 (a) (i) argentite and galena (or formulae) ; [1]  
(ii) scheelite (or formula) ; [1]
- (b) both particles correctly labelled ;; [2]
- (c) (i) heat given off / exothermic / (water) temperature increases ;  
effervescence / fizzing / gas given off ;  
sodium (reacts and) dissolves ;  
reacts vigorously ; [max 2]
- (ii) faster / more violent / reference to flame appearing ; [1]
- (iii) → potassium hydroxide + hydrogen ;; [2]
- [Total: 9]**
- 2 (a) correct units on both axes ;  
correct labelled axes and suitable scale ;  
points correctly positioned ;  
three correct lines ; [4]
- (b) average speed = distance / time ;  
= 200 / 25 = 8 (m/s) ; [2]
- (c) (i) heat energy transferred from body to sweat / heat absorbed by sweat from athlete's body ;  
kinetic energy of water molecules increases / some molecules move faster than others ;  
more energetic / faster moving (water) molecules escape / leave surface / break bonds / break forces of attraction ;  
kinetic energy of remaining (water molecules) decreases / average kinetic energy of (water) molecules decreases ; [max 3]
- (ii) (higher) temperature  
(lower) humidity  
(higher) wind speed  
(larger) surface area  
any **two** for 1 mark ; [max 1]
- [Total: 10]**

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- 3** (a) catalyst ;  
biological / that works in living organisms ;  
protein ; [max 2]
- (b) greatest activity at pH 6.5 ;  
no activity at / below pH 4 or at / above pH 9 ; [2]
- (c) (i) curve of similar shape with peak at pH 4 or below ; [1]
- (ii) sodium hydrogen carbonate neutralises the acid ;  
so pH rises (above optimum for enzyme) / becomes too alkaline ; [2]
- (iii) protein ;  
amino acids / polypeptides ; [2]
- (iv) chemical digestion ;  
large molecules broken down to small ones ;  
which can be absorbed / taken into blood / pass through gut wall ; [max 2]
- [Total: 11]**
- 4** (a) molecules collide with tyre wall ;  
force exerted causing pressure ; [2]
- (b) change shape ;  
change speed / start object moving / stop object moving / acceleration etc. ;  
change direction of motion of object ;  
(three correct gains 2 marks, one or two correct gains 1 mark) [2]
- (c) **B** – car is decelerating ; [1]
- (d) chemical ;  
burned ;  
kinetic ;  
heat ;  
sound ; [5]

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- (e) symbols ;  
 everything else correct in complete / full circuit ;  
 lamps in parallel ;  
 (and if lamps in parallel) then switch operates both lamps ;  
 e.g.



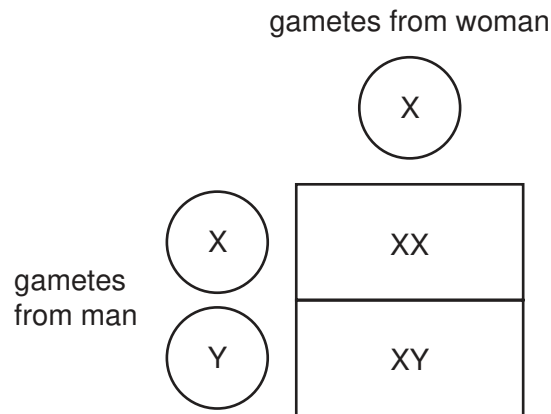
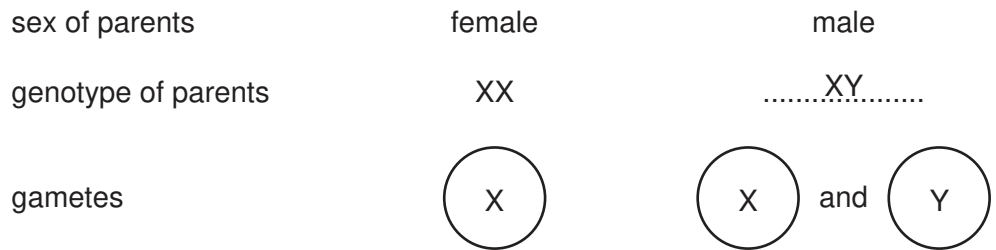
[4]

**[Total: 14]**

- 5 (a) (i) cracking ; [1]
- (ii) increases reaction rate ;  
 is not consumed / unchanged at end of reaction ; [2]
- (iii) add bromine (solution) ;  
 if saturated colour changes from orange to colourless ; [2]  
 (allow potassium manganate(VII) purple to colourless)
- (b) (i) as molecular size increases boiling point increases ; [1]
- (ii) uses related to bottled gas such as heating / lighting ; [1]
- (iii) reaction between the fuel / gasoline and oxygen / air / incomplete combustion ;  
 poisonous for humans / detail ; [2]

**[Total: 9]**

- 6 (a) male shown as **XY** ;  
**X** in first circle, **X** and **Y** in other two circles (either way round) ;  
**XX** and **XY** correctly shown in grid ;



[3]

- (b) (i) trees reduce the temperature ;  
reference to figures from the graph/quantitative comparison ; [2]
- (ii) open sand is hotter (than 29 °C) and so produced more females ;  
in forest lower than 29 °C and so produced more males ; [2]
- (iii) deforestation will result in hotter sand ;  
so more female turtles produced ;  
which might make breeding difficult/might reduce number of young born ; [max 2]
- (c) global warming/effects of global warming/more carbon dioxide in atmosphere ;  
allow climate change/greenhouse effect/less oxygen in the atmosphere ;  
more soil erosion ;  
more flooding ; [max 2]

**[Total: 11]**

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7 (a) beta radiation passes through paper but is stopped thick aluminium or lead ;  
gamma radiation able to pass through aluminium and thin lead ; [2]

(b) distance between two waves ;  
distance between identical points on two successive waves ; [2]  
(or shown on diagram)

(c) ionizing radiation ;  
causes cancer etc. ; [2]

**[Total: 6]**

8 (a) use of chlorine / ozone / ultrafiltration ;  
removes harmful microorganisms ;  
**OR**  
filtration ;  
removes insolubles ; [max 2]

(b) in water (molecules) hydrogen (atoms) are bonded to oxygen (atoms) ;  
in the mixture only like atoms are bonded ;  
**OR**  
in water the H:O ratio is 2:1 ;  
in the mixture no fixed ratio ;  
**OR**  
water unreactive / puts out flame ;  
mixture burns / will react ; [max 2]

(c) (i) heat the solution ;  
water evaporates (leaving the crystals) ; [2]

(ii) (no)  
hexane is a liquid (at room temperature) ;  
so also passes through filter ; [2]

(d) (i) metal ;  
oxide is metal bonded to non metal ;  
so is ionic ;  
ionic compounds are always solids ; [max 2]

(ii) allow blue / shades of blue / shades of purple ;  
metal oxides are basic / has formed an alkaline solution ; [2]

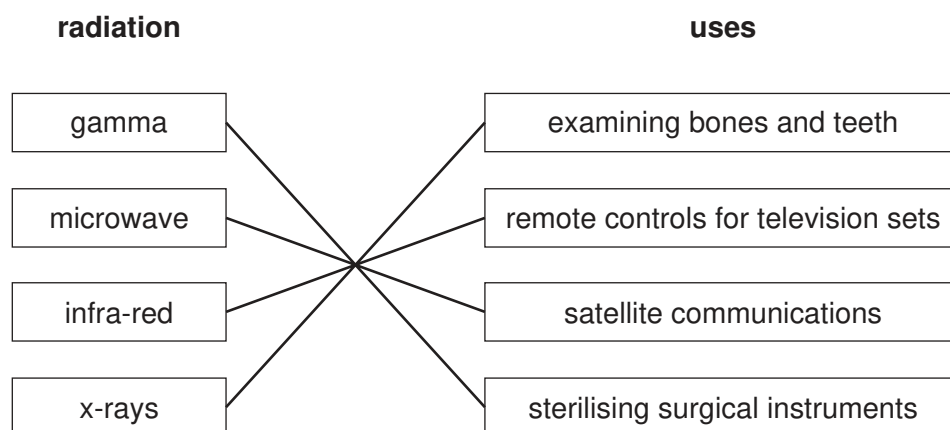
**[Total: 12]**

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- 9 (a) carbon dioxide ;  
glucose / carbohydrate / sugar / starch + oxygen ; [2]
- (b) **A** palisade layer / mesophyll ;  
**B** epidermis / epidermal cell ; [2]
- (c) allow carbon dioxide to enter (the leaf) ;  
or oxygen to leave ;  
by diffusion ; [max 2]
- (d) transpiration ; [1]
- (e) idea of conserving water / reducing water loss ; [1]
- (f) stomata are in contact with the air ;  
so they can get, carbon dioxide / oxygen or so that they can exchange gases ; [2]
- (g) to make chlorophyll ; [1]
- [Total: 11]**

- 10 (a) *radio* – transverse, *sound* – longitudinal ;  
radio higher frequency ;  
radio higher speed ; [3]

(b)



(all correct = 3 marks, two correct = 2 marks, one correct = 1 mark) ;;; [3]

- (c) speed = distance / time ;  
= 500 / 1.5 = 333 (m/s) ; [2]

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(d) density = mass/volume ;  
= 10000/1.1 = 9091 (kg/m<sup>3</sup>) ; [2]

[Total: 10]

11 (a) (i) (expt. 2)  
potassium hydroxide is an alkali ; [1]

(ii) (expt. 1)  
temperature decreased ; [1]

(iii) no reaction occurred/no energy was transferred ;  
copper is less reactive than magnesium (so no reaction) ; [max 1]

(b) (expt. 5)  
the rate of reaction was greater ;  
so energy was transferred more quickly ;  
because powder has greater surface area ; [max 2]

(c) (i) hydrogen ;  
pops on ignition ; [2]

(ii) add acid to the mixed metals ;  
reference to adding excess acid e.g. until bubbling stops ;  
zinc reacts and dissolves ;  
copper does not react/does not dissolve ;  
filter off the copper ; [max 3]

[Total: 10]

12 (a) (chemical reactions that) break down nutrient (molecules) ;  
to release energy ; [2]

(b)

gas	percentage in inspired air	percentage in expired air
oxygen	(21)	17 ;
carbon dioxide	0.04	(4) ;
nitrogen	78	78 ;

(1 mark per correct row) [3]

(c) in red blood cells ;  
combined with/attached to, haemoglobin ; [2]

[Total: 7]